Amendment to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (currently amended): A polarization-insensitive integrated wavelength converter comprising:

a wavelength converter having first and second input/output ports <u>on opposite sides of an optical path through said wavelength converter</u>;

a polarization separator having a first port for receiving an input optical signal, a second port providing a first component of the input optical signal in a first polarization mode, and a third port providing a second component of the input optical signal in a second polarization mode, with the second port of the polarization separator optically coupled to the first input/output port of the wavelength converter; and

a polarization rotator coupling the third port of the polarization separator to the second input/output port of the wavelength converter that rotates the polarization mode of an optical signal propagating through the polarization rotator.

Claim 2 (currently amended): The apparatus of claim 1 wherein said polarization rotator comprises an electro-optic half-wave retarder[[;]]<u>.</u>

Claim 3 (currently amended): The apparatus of claim 1 wherein said polarization rotator comprises a half-wave plate[[;]]<u>.</u>

Claim 4 (currently amended): The apparatus of claim 2 ~~**further including a bent waveguide;**~~ <u>wherein said polarization rotator comprises a portion of a waveguide in a substrate and electrodes on said substrate near said waveguide portion.</u>

Claim 5 (original): The apparatus of claim 1 wherein said polarization rotator comprises an electro-optic quarter-wave retarder.

Claim 6 (original): The apparatus of claim 1 wherein said polarization rotator comprises a quarter-wave plate.

Claim 7 (currently amended): The apparatus of claim 4 further including a mirror attached to said substrate so as to reflect back light from said waveguide.

Claim 8 (original): The apparatus of claim 1 wherein said polarization rotator comprises an optical fiber having a 90° twist to change the polarization mode.

Claim 9 (currently amended): The apparatus of claim 1 wherein said polarization rotator comprises:

a plurality of light signal propagating paths;

wherein said wavelength converter comprises:

a plurality of processing channels, each having a first input/output port and a second input/output port, each second input/output port coupled to a respective light signal propagating path; and

wherein said ~~polarizing beam splitter~~ polarization separator comprises:

a plurality of channels ~~coupling~~ coupled to the processing channels and light signal propagating paths.

Claim 10 (original): The apparatus of claim 1 wherein at least a portion of said wavelength converter comprises a quasi-phasematched structure.

Claim 11 (original): The apparatus of claim 10 wherein at least a portion of said quasi-phasematched structure is incorporated in lithium niobate.

Claim 12 (original): The apparatus of claim 10 wherein at least a portion of said quasi-phasematched structure is incorporated in magnesium-oxide-doped lithium niobate.

Claim 13 (original): The apparatus of claim 10 wherein at least a portion of said quasi-phasematched structure is incorporated in lithium tantalate.

Claim 14 (original): The apparatus of claim 10 wherein at least a portion of said quasi-phasematched structure is incorporated in magnesium-oxide-doped lithium tantalate.

Claim 15 (currently amended): The apparatus of claim 1 wherein said wavelength converter comprises ~~further comprising~~ a waveguide structure.

Claim 16 (original): The apparatus of claim 15 further wherein said waveguide structure includes a proton-exchanged waveguide.

Claim 17 (original): The apparatus of claim 15 further wherein said waveguide structure includes an annealed-proton-exchanged waveguide.

Claim 18 (original): The apparatus of claim 15 further wherein said waveguide structure includes a zinc-diffused waveguide.

Claim 19 (original): The apparatus of claim 15 further wherein said waveguide structure includes a metal-diffused waveguide.

Claim 20 (original): The apparatus of claim 15 further wherein said waveguide structure includes a titanium-diffused waveguide.

Claim 21 (original): The apparatus of claim 15 further wherein said waveguide structure includes a buried waveguide.

Claim 22 (original): The apparatus of claim 15 further wherein said waveguide structure includes a reverse-proton-exchange waveguide.

Claim 23 (currently amended): The apparatus of claim 1 further comprising an optical circulator having a port coupled to the first port of the ~~polarizing beam splitter~~ polarization separator.

Claim 24 (currently amended): The apparatus of claim 1 wherein said polarization rotator couples the third port of the polarization to the second input/output port of the wavelength converter, and further comprising an electro-optic phase modulator alternatively coupled to the second port of said polarization separator and the first input/output port of the wavelength converter, or coupled to the third port of said polarization separator and the polarization rotator, for modifying the phase of at least one of the components of the optical signal.

Claim 25 (cancel)

Claim 26 (original): The apparatus of claim 1 wherein input optical signal comprises a plurality of optical signals.

Claim 27 (currently amended): A polarization-insensitive integrated wavelength converter comprising:

a ~~wavelength converter~~ substrate;

a polarization separator serving to separate an input optical signal into first and second signal components having orthogonal polarization modes[[.]];

a polarization rotator having a portion in said substrate serving to rotate the polarization mode of at least one of said first and second signal components[[,]];

a wavelength converter structure in said substrate for receiving said signal components and generating converted signal components; and

waveguides in said substrate carrying first and second signal components to couple said polarization separator and said polarization rotator to said wavelength converter structure.

Claim 28 (original): The apparatus of claim 27 in which said converted signal components comprise a frequency-converted input signal.

Claim 29 (original): The apparatus of claim 27 in which said converted signal components comprise an amplified input signal.

Claim 30 (original): The apparatus of claim 27 in which said input signal includes a pump signal.

Claim 31 (original): The apparatus of claim 27 in which said converted signal components include a frequency-doubled pump signal.

Claim 32 (original): The apparatus of claim 27 further comprising

an optical circulator structure for providing isolation between the converted signal and an input signal source.

Claim 33 (original): The apparatus of claim 32 wherein said circulator further comprises

a first port coupled to said input signal source for receiving said input optical signal, a second port coupled to said polarization separator, and a third port for providing converted signal.

Claim 33b (cancel)

Claim 34 (original): The apparatus of claim 27 further comprising an input port for receiving and transmitting one or more input optical signals.

Claim 35 (original): The apparatus of claim 27 wherein said polarization separator includes a first port for receiving said input optical signal, a second port for transmitting a first component of said input optical signal in a first polarization mode, and a third

port for transmitting a second component of said input optical signal in a second polarization mode.

Claim 36 (original): The apparatus of claim 27 wherein said polarization rotator includes a coupler for providing coupling between said polarization separator and said wavelength converter structure.

Claim 37 (currently amended): A polarization-insensitive integrated wavelength converter comprising:

a ~~wavelength converter~~ substrate;

a first waveguide, formed in said substrate, capable of supporting light signals in both TM and TE polarization modes and having first and second input/output ports;

a second waveguide, formed in said substrate, capable of supporting light signals in at least one of the TM and TE polarization modes and having first and second coupling sections disposed near said first waveguide to evanescently couple light signals between said first waveguide and said second waveguide;

a reflector coupled to the second input/output port of said ~~second~~ first waveguide;

a polarization rotator region disposed between the first and second coupling sections; and

a wavelength converter region formed in at least one of the first waveguide and second waveguide~~; and~~

~~a coupler serving to couple said wavelength converter region to said polarization rotator region~~ whereby said reflector sends light signals from the second input/output port back into the second input/output port and said polarization rotator switches light signals in one polarization mode to the other polarization mode.

Claim 38 (currently amended): A polarization-insensitive integrated wavelength converter comprising:

a ~~converter~~ substrate;

a first waveguide, formed in ~~the~~ said substrate, having first and second input/output ports;

a second waveguide, formed in ~~the~~ said substrate, having first and second coupling sections disposed near said first wave guide to evanescently couple light signals between the first waveguide and the second waveguide ~~(supporting only TE polarization modes)~~;

a polarization rotator including a region disposed on the first waveguide ~~(between the second coupling section and the second input/output port of said first waveguide)~~;

a reflector coupled to the second input/output port of ~~the~~ said first waveguide; and

a wavelength converting structure formed in at least one of the first waveguide and second waveguide;

whereby said reflector sends light signals from the second input/output port back into the second input/output port and said polarization rotator switches light signals in one polarization mode to the other polarization mode.

Claim 39 (original): The apparatus of claim 38 wherein said first waveguide is capable of supporting optical signals having both TE and TM polarization modes.

Claim 40 (original): The apparatus of claim 38 wherein said first waveguide includes a metal waveguide.

Claim 41 (original): The apparatus of claim 38 wherein said first waveguide includes a buried waveguide.

Claim 42 (original): The apparatus of claim 38 wherein said first waveguide includes a diffused waveguide.

Claim 43 (original): The apparatus of claim 38 wherein said first waveguide includes a Zinc waveguide.

Claim 44 (original): The apparatus of claim 38 wherein said first waveguide includes a Titanium waveguide.

Claim 45 (original): The apparatus of claim 38 wherein said second waveguide includes a proton-exchanged waveguide.

Claim 46 (original): The apparatus of claim 38 wherein said second waveguide includes an annealed- proton-exchanged waveguide.

Claim 47 (original): The apparatus of claim 38 wherein said second waveguide includes a buried waveguide.

Claim 48 (original): The apparatus of claim 38 wherein said polarization rotator includes a wave plate.

Claim 49 (original): The apparatus of claim 38 wherein said polarization rotator includes a quarter-wave plate.

Claim 50 (original): The apparatus of claim 38 wherein said polarization rotator includes a half-wave plate.

Claim 51 (original): The apparatus of claim 38 wherein said polarization rotator includes an electro-optic wave plate.

Claim 52 (currently amended): The apparatus of claim ~~38~~ <u>51</u> wherein said polarization rotator ~~is~~ <u>includes electrodes</u> positioned near <u>the region of</u> said first waveguide.

Claim 53 (currently amended): The apparatus of claim 38 wherein said polarization rotator <u>region</u> is positioned ~~near first waveguide~~ between said first coupling section and said second coupling section.

Claim 54 (currently amended): The apparatus of claim 38 wherein said polarization rotator region is positioned ~~near first waveguide~~ between said second coupling section and said reflector.

Claim 55 (currently amended): The apparatus of claim 38 wherein said polarization rotator includes a waveplate inserted into a saw cut in said ~~converter~~ substrate.

Claim 56 (currently amended): The apparatus of claim 38 wherein said polarization rotator includes a waveplate fastened to the end of said ~~converter~~ substrate.

Claim 57 (currently amended): The apparatus of claim 38 wherein said polarization rotator includes a waveplate fastened between the end of said ~~converter~~ substrate and said reflector.

Claim 58 (original): The apparatus of claim 38 wherein said reflector serves to reflect said input signals.

Claim 59 (original): The apparatus of claim 38 wherein said reflector serves to reflect said converted signals.

Claim 60 (original): The apparatus of claim 38 wherein said reflector serves to reflect pump signals.

Claim 61 (cancel)

Claim 62 (original): The apparatus of claim 38 wherein said reflector serves to reflect frequency-doubled pump signals.

Claims 63-65 (cancel)

Claim 66 (original): The apparatus of claim 38 wherein said wavelength converting structure includes a ferroelectric crystal.

Claim 67 (original): The apparatus of claim 38 wherein said wavelength converting structure includes a periodically-poled ferroelectric crystal capable of performing quasi-phasematching.

Claim 68 (original): The apparatus of claim 38 wherein said wavelength converting structure includes lithium niobate.

Claim 69 (original): The apparatus of claim 38 wherein said wavelength converting structure includes magnesium-doped lithium niobate.

Claim 70 (original): The apparatus of claim 38 wherein said wavelength converting structure includes congruent lithium niobate.

Claim 71 (original): The apparatus of claim 38 wherein said wavelength converting structure includes stoichiometric lithium niobate.

Claim 72 (original): The apparatus of claim 38 wherein said wavelength converting structure includes lithium tantalate.

Claim 73 (original): The apparatus of claim 38 wherein said wavelength converting structure includes magnesium-doped lithium tantalate.

Claim 74 (original): The apparatus of claim 38 wherein said wavelength converting structure includes congruent lithium tantalate.

Claim 75 (original): The apparatus of claim 38 wherein said wavelength converting structure includes stoichiometric lithium tantalate.

Claim 76 (original): The apparatus of claim 38 further including an electro-optic index modulator positioned near at least one of first waveguide and second waveguide, said modulator serving to control the optical path length of waveguides near said modulator.

Claim 77 (currently amended): A polarization-insensitive integrated wavelength converter comprising:

a wavelength converter, having a gain level, for receiving ~~said~~ component input signals and generating component converted signals,

a polarization separator for separating an input signal into component input signals having orthogonal polarization modes,

a polarization rotator for rotating the polarization modes of said component input signal and optical signal propagating through the polarization rotator, and

an interchannel crosstalk modulator, comprising a detector and modulator structure, serving to detect levels of interchannel crosstalk between wavelength-converted optical signals whereby one or more of the amplitude of input optical signals and converter gain level are modified accordingly to reduce interchannel crosstalk.

Claim 78 (currently amended): The apparatus of claim 77 wherein said wavelength converter includes controls for modifying the gain level of at least one of said converted signal, said input signal and a pump signal.

Claim 79 (currently amended): The apparatus of claim ~~77~~ 78 wherein said controls include an optical parametric amplifier for providing said gain level.

Claim 80 (currently amended): The apparatus of claim ~~77~~ 78 wherein said controls include an EDFA for providing said gain level.

Claim 81 (currently amended): The apparatus of claim ~~77~~ 78 wherein said controls include a pump diode for providing said gain level.

Claim 82 (currently amended): The apparatus of claim ~~77~~ 78 wherein said controls include a semiconductor optical amplifier for providing said gain level.

Claim 83 (currently amended): The apparatus of claim ~~77~~ 78 wherein said controls include an optical attenuator.

Claim 84 (original): The apparatus of claim 77 further including an optical filter structure for discriminating between said input signals, said converted signals, pump signals and non-converted signals.

Claim 85 (currently amended): The apparatus of claim 84 wherein said optical filter structure includes at least one optical interleaver. **[[.]]**

Claim 86 (original): The apparatus of claim 84 wherein said optical filter structure includes at least one arrayed waveguide.

Claim 87 (currently amended): A polarization-insensitive integrated wavelength converter comprising:

~~**a wavelength converter having an input/output port ;**~~

a polarization separator having

a first port for receiving an input optical signal, optically coupled to the input/output port of the wavelength converter,

a second port providing a first component of the input optical signal in a first polarization mode, and

a third port providing a second component of the input optical signal in a second polarization mode,

a wavelength converting structure having a first port and a second port on opposite sides of an optical path through said wavelength converting structure, said first port

being coupled to the second port of the polarization separator, serving to provide wavelength conversion on said input optical signal,

a polarization rotator coupling the second port of the wavelength converting structure to the third port of the polarization separator, serving to rotate the polarization of the said input signal.

Claim 88 (currently amended): A polarization-insensitive integrated wavelength converter comprising:

a polarization separator having two or more waveguides that support orthogonal polarization modes of an input signal, said waveguides formed in a substrate;

a wavelength converting structure formed in the substrate, said wavelength converting structure serving to provide wavelength conversion on said input optical signal[[,]]; and

a polarization rotator formed in the substrate, said polarization rotator serving to rotate the polarization of the said input signal~~, and~~

~~a coupler serving to optically couple said waveguides~~.

Claim 89 (currently amended): A polarization-insensitive integrated wavelength converter comprising:

a waveguide that supports an input signal having a plurality of polarizations,

a wavelength converting structure, serving to provide wavelength conversion on at least one polarization mode of said input optical signal[[,]];

a polarization rotator, serving to rotate the said plurality of polarizations of the said input signal[[,]]; and

a reflector serving to reflect said input signal back through said wavelength converting structure.

Claim 90 (currently amended): A polarization-insensitive integrated wavelength converter comprising:

at least one polarization ~~splitter~~ separator comprising a first waveguide that supports an input signal having a plurality of polarizations, and a second waveguide that supports at least one polarization mode of said input signal[[,]];

a wavelength converting structure serving to provide wavelength conversion on at least one polarization mode of said input optical signal[[,]]; and

a polarization rotator, serving to rotate the polarizations of said input signal in at least one of first or second waveguides.

Claim 91 (currently amended): A polarization-insensitive integrated wavelength converter comprising:

at least one polarization ~~splitter~~ separator comprising a first waveguide that supports an input signal having a plurality of polarizations, and a second waveguide that supports one polarization mode of said input signal[[,]];

a wavelength converting structure, serving to provide wavelength conversion on at least one polarization mode of said input optical signal[[,]]; and

a lens, wave plate and reflector assembly serving to optically couple said first and second waveguides.

Claim 92 (original): The apparatus of claim 91 wherein said wavelength conversion structure further comprises an optical frequency synthesizer, serving to provide frequency translation on said input signals.

Claim 93 (original): A polarization-insensitive integrated wavelength converter comprising:

an optical circulator;

a substrate;

a waveguide, formed in said substrate, capable of supporting both TM and TE polarization modes and having first and second input/output ports;

a polarization rotator region disposed at the second input/output port;

a reflector coupled to said polarization rotator region; and

a wavelength converter region formed in the waveguide.

Claim 94 (original): A polarization-insensitive integrated wavelength converter comprising:

a substrate;

a waveguide, formed in said substrate, capable of supporting both TM and TE polarization modes and having first and second input/output ports;

a polarization rotator region disposed at the second input/output port;

a reflector coupled to said polarization rotator region; and

a wavelength converter region formed in the waveguide.

Claim 95 (new): The apparatus of claim 5 wherein said polarization rotator comprises a portion of a waveguide in a substrate and electrodes on said substrate near said waveguide portion.

Claim 96 (new): The apparatus of claim 95 further including a mirror attached to said substrate so as to reflect back light from said waveguide.

Claim 97 (new): The apparatus of claim 32 wherein said circulator is integrated into said wavelength converter substrate.

Claim 98 (new): The apparatus of claim 88 further including a coupler serving to optically couple the waveguides.